



#6

1

SEQUENCE LISTING

<110> ADNEY, WILLIAM S.
DING, SHI-YOU
MCCARTER, SUZANNE
HIMMEL, MICHAEL E.
DECKER, STEPHEN R.
VINZANT, TODD B.

<120> THERMAL TOLERANT EXOGLUCANASE FROM ACIDOTHERMUS
CELLULOLYTICUS

<130> 40197.5US01

<140> 09/917,384

<141> 2001-07-28

<160> 11

<170> PatentIn Ver. 2.1

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<212> PRT

<213> Acidothermus cellulolyticus

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35 40 45

Pro Ser Asp Asn Gln Ile Lys Pro Gly Leu Gln Leu Val Asn Thr Gly
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Ser Ser Ser Val Asp Leu Ser Thr Val Thr Val Arg Tyr Trp Phe Thr
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Arg Asp Gly Gly Ser Ser Thr Leu Val Tyr Asn Cys Asp Trp Ala Ala
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Met Gly Cys Gly Asn Ile Arg Ala Ser Phe Gly Ser Val Asn Pro Ala
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Thr Pro Thr Ala Asp Thr Tyr Leu Gln Leu Ser Phe Thr Gly Gly Thr
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Leu Ala Ala Gly Gly Ser Thr Gly Glu Ile Gln Asn Arg Val Asn Lys
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Ser Asp Trp Ser Asn Phe Asp Glu Thr Asn Asp Tyr Ser Tyr Gly Thr
145 150 155 160

See
C6

Asn Thr Thr Phe Gln Asp Trp Thr Lys Val Thr Val Tyr Val Asn Gly
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 Val Leu Val Trp Gly Thr Glu Pro Ser Gly Ala Thr Ala Ser Pro Ser
 180 185 190
 Ala Ser Ala Thr Pro Ser Pro Ser Ser Pro Thr Thr Ser Pro Ser
 195 200 205
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 Ser Pro Pro Pro Ser Ser Asn Asp Pro Tyr Ile Gln Arg Phe Leu Thr
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 Met Tyr Asn Lys Ile His Asp Pro Ala Asn Gly Tyr Phe Ser Pro Gln
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 Gly Ile Pro Tyr His Ser Val Glu Thr Leu Ile Val Glu Ala Pro Asp
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 Tyr Gly His Glu Thr Thr Ser Glu Ala Tyr Ser Phe Trp Leu Trp Leu
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 Glu Ala Thr Tyr Gly Ala Val Thr Gly Asn Trp Thr Pro Phe Asn Asn
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 305 310 315 320
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 Pro Val Gly His Asp Pro Leu Ala Ala Glu Leu Gln Ser Thr Tyr Gly
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 Thr Pro Asp Ile Tyr Gly Met His Trp Leu Ala Asp Val Asp Asn Ile
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 385 390 395 400
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 405 410 415
 Ser Val Trp Glu Thr Val Thr Gln Pro Thr Cys Asp Asn Gly Lys Tyr
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 Gly Gly Ala His Gly Tyr Val Asp Leu Phe Ile Gln Gly Ser Thr Pro
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Gln Ala Ala Tyr Trp Ala Tyr Thr Trp Ala Ser Ala Gln Gly Lys Ala
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 Trp Ser Ile Pro Ser Asn Leu Ser Trp Ser Gly Gln Pro Asp Thr Trp
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 705 710 715 720
 Ser Ser Gly Gln Asp Val Gly Val Ala Ala Ala Leu Ala Lys Thr Leu
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 Glu Tyr Tyr Ala Ala Lys Ser Gly Asp Thr Ala Ser Arg Asp Leu Ala
 740 745 750
 Lys Gly Leu Leu Asp Ser Met Trp Asn Asn Asp Gln Asp Ser Leu Gly
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Val Ser Thr Pro Glu Thr Arg Thr Asp Tyr Ser Arg Phe Thr Gln Val
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 Tyr Asp Pro Thr Thr Gly Asp Gly Leu Tyr Ile Pro Ser Gly Trp Thr
 785 790 795 800
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 Ser Ile Arg Ser Trp Tyr Thr Lys Asp Pro Gln Trp Ser Lys Val Gln
 820 825 830
 Ala Tyr Leu Asn Gly Gly Pro Ala Pro Thr Phe Asn Tyr His Arg Phe
 835 840 845
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Tyr Asn Asn Val Ile Gln Pro Gly Gln Ser Thr Thr Phe Gly Phe Asn
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<212> PRT

<213> Acidothermus cellulolyticus

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<213> Acidothermus cellulolyticus

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Asp Asn Gln Ile Lys Pro Gly Leu Gln Leu Val Asn Thr Gly Ser Ser
      20             25             30

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```

Ser Val Asp Leu Ser Thr Val Thr Val Arg Tyr Trp Phe Thr Arg Asp
      35             40             45

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Gly Gly Ser Ser Thr Leu Val Tyr Asn Cys Asp Trp Ala Ala Met Gly
      50             55             60

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Cys Gly Asn Ile Arg Ala Ser Phe Gly Ser Val Asn Pro Ala Thr Pro
      65             70             75             80

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Thr Gln Pro Thr Cys Asp Asn Gly Lys Tyr Gly Gly Ala His Gly Tyr
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 Val Asp Leu Phe Ile Gln Gly Ser Thr Pro Pro Gln Trp Lys Tyr Thr
 210 215 220
 Asp Ala Pro Asp Ala Asp Ala Arg Ala Val Gln Ala Ala Tyr Trp Ala
 225 230 235 240
 Tyr Thr Trp Ala Ser Ala Gln Gly Lys Ala Ser Ala Ile Ala Pro Thr
 245 250 255
 Ile Ala Lys Ala Ser Gln Thr Gly Asp Tyr Leu Arg Tyr Ser Leu Phe
 260 265 270
 Asp Lys Tyr Phe Lys Gln Val Gly Asn Cys Tyr Pro Ala Ser Ser Cys
 275 280 285
 Pro Gly Ala Thr Gly Arg Gln Ser Glu Thr Tyr Leu Ile Gly Trp Tyr
 290 295 300
 Tyr Ala Trp Gly Gly Ser Ser Gln Gly Trp Ala Trp Arg Ile Gly Asp
 305 310 315 320
 Gly Ala Ala His Phe Gly Tyr Gln Asn Pro Leu Ala Ala Trp Ala Met
 325 330 335
 Ser Asn Val Thr Pro Leu Ile Pro Leu Ser Pro Thr Ala Lys Ser Asp
 340 345 350
 Trp Ala Ala Ser Leu Gln Arg Gln Leu Glu Phe Tyr Gln Trp Leu Gln
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 Ser Ala Glu Gly Ala Ile Ala Gly Gly Ala Thr Asn Ser Trp Asn Gly
 370 375 380
 Asn Tyr Gly Thr Pro Pro Ala Gly Asp Ser Thr Phe Tyr Gly Met Ala
 385 390 395 400
 Tyr Asp Trp Glu Pro Val Tyr His Asp Pro Pro Ser Asn Asn Trp Phe
 405 410 415
 Gly Phe Gln Ala Trp Ser Met Glu Arg Val Ala Glu Tyr Tyr Tyr Val
 420 425 430
 Thr Gly Asp Pro Lys Ala Lys Ala Leu Leu Asp Lys Trp Val Ala Trp
 435 440 445
 Val Lys Pro Asn Val Thr Thr Gly Ala Ser Trp Ser Ile Pro Ser Asn
 450 455 460
 Leu Ser Trp Ser Gly Gln Pro Asp Thr Trp Asn Pro Ser Asn Pro Gly
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 Thr Asn Ala Asn Leu His Val Thr Ile Thr Ser Ser Gly Gln Asp Val
 485 490 495

Gly Val Ala Ala Ala Leu Ala Lys Thr Leu Glu Tyr Tyr Ala Ala Lys
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 Ser Gly Asp Thr Ala Ser Arg Asp Leu Ala Lys Gly Leu Leu Asp Ser
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 530 535 540
 Arg Thr Asp Tyr Ser Arg Phe Thr Gln Val Tyr Asp Pro Thr Thr Gly
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 Asp Gly Leu Tyr Ile Pro Ser Gly Trp Thr Gly Thr Met Pro Asn Gly
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 Asp Gln Ile Lys Pro Gly Ala Thr Phe Leu Ser Ile Arg Ser Trp Tyr
 580 585 590
 Thr Lys Asp Pro Gln Trp Ser Lys Val Gln Ala Tyr Leu Asn Gly Gly
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 35 40 45
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 Gln Ser Phe Ala Gly
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<400> 7

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 35 40 45

Asn Tyr Trp Asn Thr Ala Leu Thr Gln Ser Gly Lys Ser Val Thr Ala
 50 55 60

Lys Asn Leu Ser Tyr Asn Asn Val Ile Gln Pro Gly Gln Ser Thr Thr
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Phe Gly Phe Asn Gly Ser Tyr Ser Gly Thr Asn Thr Ala Pro Thr Leu
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Ser Cys Thr Ala Ser
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<211> 6

<212> PRT

<213> Artificial Sequence

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<400> 8

His His His His His His
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<210> 9

<211> 638

<212> PRT

<213> Acidothermus cellulolyticus

<400> 9

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Ala Asn Gly Tyr Phe Ser Pro Gln Gly Ile Pro Tyr His Ser Val Glu
 20 25 30

Thr Leu Ile Val Glu Ala Pro Asp Tyr Gly His Glu Thr Thr Ser Glu
 35 40 45

Ala Tyr Ser Phe Trp Leu Trp Leu Glu Ala Thr Tyr Gly Ala Val Thr
 50 55 60

Gly Asn Trp Thr Pro Phe Asn Asn Ala Trp Thr Thr Met Glu Thr Tyr
 65 70 75 80

Met	Ile	Pro	Gln	His	Ala	Asp	Gln	Pro	Asn	Asn	Ala	Ser	Tyr	Asn	Pro	
				85					90					95		
Asn	Ser	Pro	Ala	Ser	Tyr	Ala	Pro	Glu	Glu	Pro	Leu	Pro	Ser	Met	Tyr	
			100					105					110			
Pro	Val	Ala	Ile	Asp	Ser	Ser	Val	Pro	Val	Gly	His	Asp	Pro	Leu	Ala	
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Ala	Glu	Leu	Gln	Ser	Thr	Tyr	Gly	Thr	Pro	Asp	Ile	Tyr	Gly	Met	His	
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Trp	Leu	Ala	Asp	Val	Asp	Asn	Ile	Tyr	Gly	Tyr	Gly	Asp	Ser	Pro	Gly	
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Gly	Gly	Cys	Glu	Leu	Gly	Pro	Ser	Ala	Lys	Gly	Val	Ser	Tyr	Ile	Asn	
			165						170					175		
Thr	Phe	Gln	Arg	Gly	Ser	Gln	Glu	Ser	Val	Trp	Glu	Thr	Val	Thr	Gln	
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Pro	Thr	Cys	Asp	Asn	Gly	Lys	Tyr	Gly	Gly	Ala	His	Gly	Tyr	Val	Asp	
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Leu	Phe	Ile	Gln	Gly	Ser	Thr	Pro	Pro	Gln	Trp	Lys	Tyr	Thr	Asp	Ala	
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			245						250					255		
Lys	Ala	Ser	Gln	Thr	Gly	Asp	Tyr	Leu	Arg	Tyr	Ser	Leu	Phe	Asp	Lys	
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	290					295					300					
Trp	Gly	Gly	Ser	Ser	Gln	Gly	Trp	Ala	Trp	Arg	Ile	Gly	Asp	Gly	Ala	
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			325						330					335		
Val	Thr	Pro	Leu	Ile	Pro	Leu	Ser	Pro	Thr	Ala	Lys	Ser	Asp	Trp	Ala	
			340					345					350			
Ala	Ser	Leu	Gln	Arg	Gln	Leu	Glu	Phe	Tyr	Gln	Trp	Leu	Gln	Ser	Ala	
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Glu	Gly	Ala	Ile	Ala	Gly	Gly	Ala	Thr	Asn	Ser	Trp	Asn	Gly	Asn	Tyr	
	370					375					380					

Gly Thr Pro Pro Ala Gly Asp Ser Thr Phe Tyr Gly Met Ala Tyr Asp
 385 390 395 400
 Trp Glu Pro Val Tyr His Asp Pro Pro Ser Asn Asn Trp Phe Gly Phe
 405 410 415
 Gln Ala Trp Ser Met Glu Arg Val Ala Glu Tyr Tyr Tyr Val Thr Gly
 420 425 430
 Asp Pro Lys Ala Lys Ala Leu Leu Asp Lys Trp Val Ala Trp Val Lys
 435 440 445
 Pro Asn Val Thr Thr Gly Ala Ser Trp Ser Ile Pro Ser Asn Leu Ser
 450 455 460
 Trp Ser Gly Gln Pro Asp Thr Trp Asn Pro Ser Asn Pro Gly Thr Asn
 465 470 475 480
 Ala Asn Leu His Val Thr Ile Thr Ser Ser Gly Gln Asp Val Gly Val
 485 490 495
 Ala Ala Ala Leu Ala Lys Thr Leu Glu Tyr Tyr Ala Ala Lys Ser Gly
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 Asp Thr Ala Ser Arg Asp Leu Ala Lys Gly Leu Leu Asp Ser Met Trp
 515 520 525
 Asn Asn Asp Gln Asp Ser Leu Gly Val Ser Thr Pro Glu Thr Arg Thr
 530 535 540
 Asp Tyr Ser Arg Phe Thr Gln Val Tyr Asp Pro Thr Thr Gly Asp Gly
 545 550 555 560
 Leu Tyr Ile Pro Ser Gly Trp Thr Gly Thr Met Pro Asn Gly Asp Gln
 565 570 575
 Ile Lys Pro Gly Ala Thr Phe Leu Ser Ile Arg Ser Trp Tyr Thr Lys
 580 585 590
 Asp Pro Gln Trp Ser Lys Val Gln Ala Tyr Leu Asn Gly Gly Pro Ala
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<210> 10
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Ala	Tyr	Ser	Tyr	Trp	Leu	Trp	Leu	Glu	Ala	Leu	Tyr	Gly	Gln	Val	Thr	50	55	60
Gln	Asp	Trp	Ala	Pro	Leu	Asn	His	Ala	Trp	Asp	Thr	Met	Glu	Lys	Tyr	65	70	75
Met	Ile	Pro	Gln	Ser	Val	Asp	Gln	Pro	Thr	Asn	Ser	Phe	Tyr	Asn	Pro	85	90	95
Asn	Ser	Pro	Ala	Thr	Tyr	Ala	Pro	Glu	Phe	Asn	His	Pro	Ser	Ser	Tyr	100	105	110
Pro	Ser	Gln	Leu	Asn	Ser	Gly	Ile	Ser	Gly	Gly	Thr	Asp	Pro	Ile	Gly	115	120	125
Ala	Glu	Leu	Lys	Ala	Thr	Tyr	Gly	Asn	Ala	Asp	Val	Tyr	Gln	Met	His	130	135	140
Trp	Leu	Ala	Asp	Val	Asp	Asn	Ile	Tyr	Gly	Phe	Gly	Ala	Thr	Pro	Gly	145	150	155
Ala	Gly	Cys	Thr	Leu	Gly	Pro	Thr	Ala	Thr	Gly	Thr	Ser	Phe	Ile	Asn	165	170	175
Thr	Phe	Gln	Arg	Gly	Pro	Gln	Glu	Ser	Val	Trp	Glu	Thr	Val	Pro	Gln	180	185	190
Pro	Ser	Cys	Glu	Glu	Phe	Lys	Tyr	Gly	Gly	Lys	Asn	Gly	Tyr	Leu	Asp	195	200	205
Leu	Phe	Thr	Lys	Asp	Ala	Ser	Tyr	Ala	Lys	Gln	Trp	Lys	Tyr	Thr	Ser	210	215	220
Ala	Ser	Asp	Ala	Asp	Ala	Arg	Ala	Val	Glu	Ala	Val	Tyr	Trp	Ala	Asn	225	230	235
Gln	Trp	Ala	Thr	Glu	Gln	Gly	Lys	Ala	Ala	Asp	Val	Ala	Ala	Thr	Val	245	250	255
Ala	Lys	Ala	Ala	Lys	Met	Gly	Asp	Tyr	Leu	Arg	Tyr	Thr	Leu	Phe	Asp	260	265	270
Lys	Tyr	Phe	Lys	Lys	Ile	Gly	Cys	Thr	Ser	Pro	Thr	Cys	Ala	Ala	Gly	275	280	285
Gln	Gly	Arg	Glu	Ala	Ala	His	Tyr	Leu	Leu	Ser	Trp	Tyr	Met	Ala	Trp	290	295	300
Gly	Gly	Ala	Thr	Asp	Thr	Ser	Ser	Gly	Trp	Ala	Trp	Arg	Ile	Gly	Ser	305	310	315

Ser His Ala His Phe Gly Tyr Gln Asn Pro Leu Ala Ala Trp Ala Leu
 325 330 335
 Ser Thr Asp Pro Lys Leu Thr Pro Lys Ser Pro Thr Ala Lys Ala Asp
 340 345 350
 Trp Ala Ala Ser Met Gln Arg Gln Leu Glu Phe Tyr Thr Trp Leu Gln
 355 360 365
 Ala Ser Asn Gly Gly Ile Ala Gly Gly Ala Thr Asn Ser Trp Asp Gly
 370 375 380
 Ala Tyr Ala Gln Pro Pro Ala Gly Thr Pro Thr Phe Tyr Gly Met Gly
 385 390 395 400
 Tyr Thr Glu Ala Pro Val Tyr Val Asp Pro Pro Ser Asn Arg Trp Phe
 405 410 415
 Gly Met Gln Ala Trp Gly Val Gln Arg Val Ala Glu Leu Tyr Tyr Ala
 420 425 430
 Ser Gly Asn Ala Gln Ala Lys Lys Ile Leu Asp Lys Trp Val Pro Trp
 435 440 445
 Val Val Ala Asn Ile Ser Thr Asp Gly Ala Ser Trp Lys Val Pro Ser
 450 455 460
 Glu Leu Lys Trp Thr Gly Lys Pro Asp Thr Trp Asn Ala Ala Ala Pro
 465 470 475 480
 Thr Gly Asn Pro Gly Leu Thr Val Glu Val Thr Ser Tyr Gly Gln Asp
 485 490 495
 Val Gly Val Ala Ala Asp Thr Ala Arg Ala Leu Leu Phe Tyr Ala Ala
 500 505 510
 Lys Ser Gly Asp Thr Ala Ser Arg Asp Lys Ala Lys Ala Leu Leu Asp
 515 520 525
 Ala Ile Trp Ala Asn Asn Gln Asp Pro Leu Gly Val Ser Ala Val Glu
 530 535 540
 Thr Arg Gly Asp Tyr Lys Arg Phe Asp Asp Thr Tyr Val Ala Asn Gly
 545 550 555 560
 Asp Gly Ile Tyr Ile Pro Ser Gly Trp Thr Gly Thr Met Pro Asn Gly
 565 570 575
 Asp Val Ile Lys Pro Gly Val Ser Phe Leu Asp Ile Arg Ser Phe Tyr
 580 585 590
 Lys Lys Asp Pro Asn Trp Ser Lys Val Gln Thr Phe Leu Asp Gly Gly
 595 600 605
 Ala Glu Pro Gln Phe Arg Tyr His Arg Phe Trp Ala Gln Thr Ala Val
 610 615 620

Ala Gly Ala Leu Ala Asp Tyr Ala Arg Leu Phe Asp Asp Gly Thr Thr
625 630 635 640

<210> 11
<211> 642
<212> PRT
<213> Thermobifida fusca

<400> 11
Ser Tyr Asp Gln Ala Phe Leu Glu Gln Tyr Glu Lys Ile Lys Asp Pro
1 5 10 15

Ala Ser Gly Tyr Phe Arg Glu Phe Asn Gly Leu Leu Val Pro Tyr His
20 25 30

Ser Val Glu Thr Met Ile Val Glu Ala Pro Asp His Gly His Gln Thr
35 40 45

Thr Ser Glu Ala Phe Ser Tyr Tyr Leu Trp Leu Glu Ala Tyr Tyr Gly
50 55 60

Arg Val Thr Gly Asp Trp Lys Pro Leu His Asp Ala Trp Glu Ser Met
65 70 75 80

Glu Thr Phe Ile Ile Pro Gly Thr Lys Asp Gln Pro Thr Asn Ser Ala
85 90 95

Tyr Asn Pro Asn Ser Pro Ala Thr Tyr Ile Pro Glu Gln Pro Asn Ala
100 105 110

Asp Gly Tyr Pro Ser Pro Leu Met Asn Asn Val Pro Val Gly Gln Asp
115 120 125

Pro Leu Ala Gln Glu Leu Ser Ser Thr Tyr Gly Thr Asn Glu Ile Tyr
130 135 140

Gly Met His Trp Leu Leu Asp Val Asp Asn Val Tyr Gly Phe Gly Phe
145 150 155 160

Cys Gly Asp Gly Thr Asp Asp Ala Pro Ala Tyr Ile Asn Thr Tyr Gln
165 170 175

Arg Gly Ala Arg Glu Ser Val Trp Glu Thr Ile Pro His Pro Ser Cys
180 185 190

Asp Asp Phe Thr His Gly Gly Pro Asn Gly Tyr Leu Asp Leu Phe Thr
195 200 205

Asp Asp Gln Asn Tyr Ala Lys Gln Trp Arg Tyr Thr Asn Ala Pro Asp
210 215 220

Ala Asp Ala Arg Ala Val Gln Val Met Phe Trp Ala His Glu Trp Ala
225 230 235 240

Lys Glu Gln Gly Lys Glu Asn Glu Ile Ala Gly Leu Met Asp Lys Ala
245 250 255

Ser	Lys	Met	Gly	Asp	Tyr	Leu	Arg	Tyr	Ala	Met	Phe	Asp	Lys	Tyr	Phe	260	265	270
Lys	Lys	Ile	Gly	Asn	Cys	Val	Gly	Ala	Thr	Ser	Cys	Pro	Gly	Gly	Gln	275	280	285
Gly	Lys	Asp	Ser	Ala	His	Tyr	Leu	Leu	Ser	Trp	Tyr	Tyr	Ser	Trp	Gly	290	295	300
Gly	Ser	Leu	Asp	Thr	Ser	Ser	Ala	Trp	Ala	Trp	Arg	Ile	Gly	Ser	Ser	305	310	315
Ser	Ser	His	Gln	Gly	Tyr	Gln	Asn	Val	Leu	Ala	Ala	Tyr	Ala	Leu	Ser	325	330	335
Gln	Val	Pro	Glu	Leu	Gln	Pro	Asp	Ser	Pro	Thr	Gly	Val	Gln	Asp	Trp	340	345	350
Ala	Thr	Ser	Phe	Asp	Arg	Gln	Leu	Glu	Phe	Leu	Gln	Trp	Leu	Gln	Ser	355	360	365
Ala	Glu	Gly	Gly	Ile	Ala	Gly	Gly	Ala	Thr	Asn	Ser	Trp	Lys	Gly	Ser	370	375	380
Tyr	Asp	Thr	Pro	Pro	Thr	Gly	Leu	Ser	Gln	Phe	Tyr	Gly	Met	Tyr	Tyr	385	390	395
Asp	Trp	Gln	Pro	Val	Trp	Asn	Asp	Pro	Pro	Ser	Asn	Asn	Trp	Phe	Gly	405	410	415
Phe	Gln	Val	Trp	Asn	Met	Glu	Arg	Val	Ala	Gln	Leu	Tyr	Tyr	Val	Thr	420	425	430
Gly	Asp	Ala	Arg	Ala	Glu	Ala	Ile	Leu	Asp	Lys	Trp	Val	Pro	Trp	Ala	435	440	445
Ile	Gln	His	Thr	Asp	Val	Asp	Ala	Asp	Asn	Gly	Gly	Gln	Asn	Phe	Gln	450	455	460
Val	Pro	Ser	Asp	Leu	Glu	Trp	Ser	Gly	Gln	Pro	Asp	Thr	Trp	Thr	Gly	465	470	475
Thr	Tyr	Thr	Gly	Asn	Pro	Asn	Leu	His	Val	Gln	Val	Val	Ser	Tyr	Ser	485	490	495
Gln	Asp	Val	Gly	Val	Thr	Ala	Ala	Leu	Ala	Lys	Thr	Leu	Met	Tyr	Tyr	500	505	510
Ala	Lys	Arg	Ser	Gly	Asp	Thr	Thr	Ala	Leu	Ala	Thr	Ala	Glu	Gly	Leu	515	520	525
Leu	Asp	Ala	Leu	Leu	Ala	His	Arg	Asp	Ser	Ile	Gly	Ile	Ala	Thr	Pro	530	535	540
Glu	Gln	Pro	Ser	Trp	Asp	Arg	Leu	Asp	Asp	Pro	Trp	Asp	Gly	Ser	Glu	545	550	555

Cont
A4

17

Gly Leu Tyr Val Pro Pro Gly Trp Ser Gly Thr Met Pro Asn Gly Asp
565 570 575

Arg Ile Glu Pro Gly Ala Thr Phe Leu Ser Ile Arg Ser Phe Tyr Lys
580 585 590

Asn Asp Pro Leu Trp Pro Gln Val Glu Ala His Leu Asn Asp Pro Gln
595 600 605

Asn Val Pro Ala Pro Ile Val Glu Arg His Arg Phe Trp Ala Gln Val
610 615 620

Glu Ile Ala Thr Ala Phe Ala Ala His Asp Glu Leu Phe Gly Ala Gly
625 630 635 640

Ala Pro

Sub
C6